

National Aeronautics and
Space Administration



EXPLORESCIENCE

Heliophysics Division
2019 MIDEX Kickoff
Division Director Nicky Fox
Oct 7th, 2020



Sounding Rockets Heritage Influences MIDEX Science

Heliophysics MIDEX-2019 Selections

Solar-Terrestrial Observer for the Response of the Magnetosphere (STORM) / David Sibeck, GSFC

"NASA's Sounding Rocket Program has played an essential role in flight proving and demonstrating the expected performance of the first wide field-of-view soft X-ray telescopes. Our team successfully flew a nine-optic panel (STORM, 12/2012) telescope and a single-optic panel (CuPID, 12/2015) telescope as secondary instruments on the DXL and DXL-2 sounding rocket missions, respectively. Now we propose to fly a much larger version of the soft X-ray telescope as the key instrument on the STORM mission."

"We wouldn't be where we are today without the immense opportunities provided by the Sounding Rocket Program. Our ability to propose a compelling instrument for the latest MIDEX round depended entirely on the opportunities provided by the Sounding Rocket Program."

HelioSwarm / Harlan Spence, University of New Hampshire in Durham

Details still being identified

Solaris / Donald Hassler, Southwest Research Institute

Instruments with direct heritage or scientific motivation through sounding rocket missions:

"Early versions of the Coronagraph (S-COR) and EUV Imager (S-EUVI) have flown on sounding rockets."

Technology developed or matured through sounding rocket program:

"The filter wheel and tip/tilt mirror mechanism on Compact Doppler Magnetograph (CDM) were based on Sounding Rocket heritage."

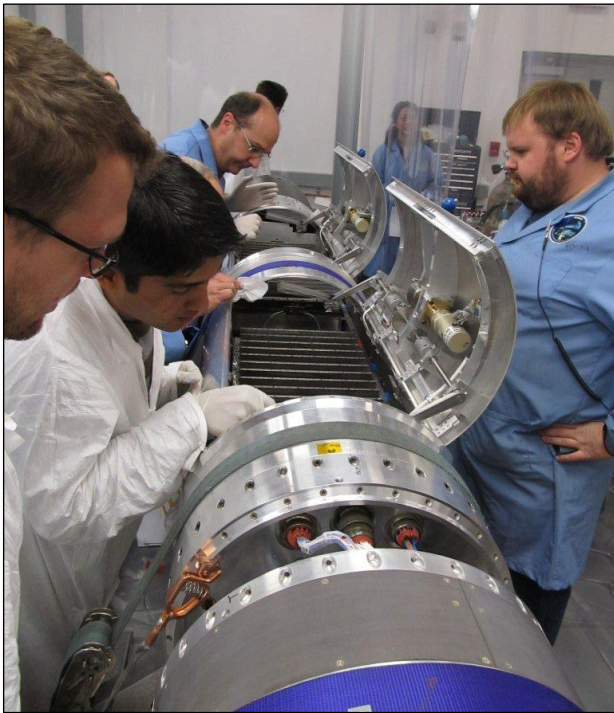


Image: DXL team prepping instrument prior to launch from White Sands Missile Range on December 2012.

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Heliophysics MIDEX-2019 Selections

Multi-slit Solar Explorer (MUSE) / Bart DePontieu, Lockheed Martin

"MUSE high-resolution context imager was scientifically motivated by discussions after the first Hi-C flight, and the launch of IRIS."

"We are also flying the same coating as Hi-C for our 195Å channel, and as Hi-C 2.1 for the 171Å channel."

"Several of our instrumentation folks have gained valuable experience through the SR program, including Amy Winebarger, Paul Boerner, Charles Kankelborg, Adrian Daw, etc. Same goes for our science folks — nothing like a SR Program to start digging into what a Science requirements traceability matrix is supposed to be about."

Auroral Reconstruction CubeSwarm (ARCS) / Kristina Lynch, Dartmouth University

"Much of our ARCS science team has grown out of existing sounding rocket collaborations, particularly those of ISINGLASS (Lynch 36.303/304) and GREECE (Samara 36.287)."

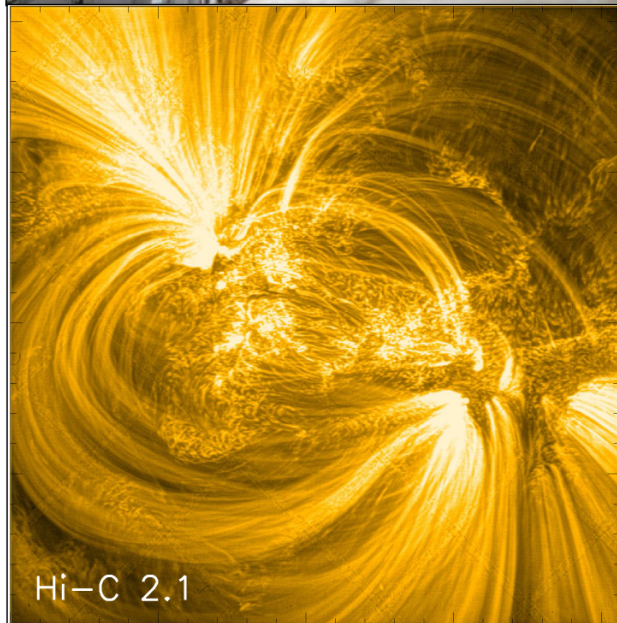
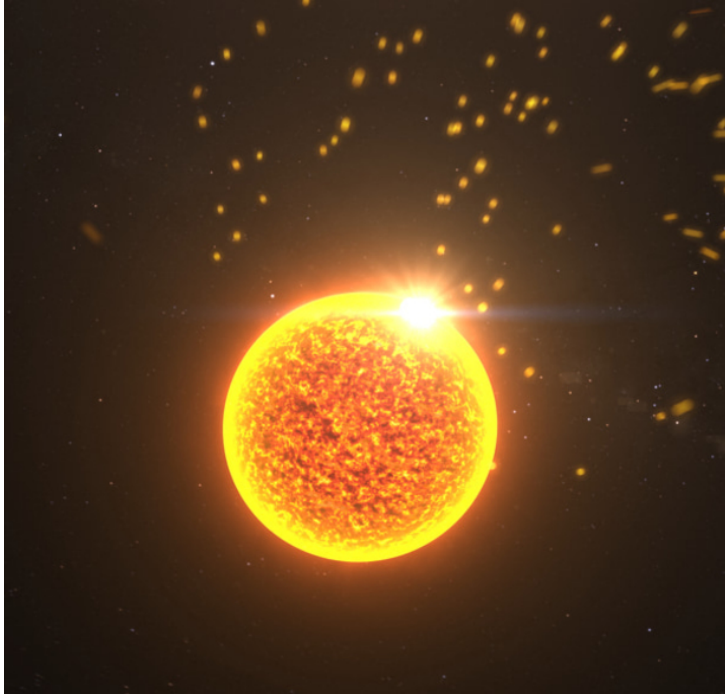


Image (Top): Hi-C team complete an alignment procedure on the instrument prior to shipping to White Sands Missile Range for July 2016 launch.

Image (Bottom): Image from Hi-C 2.1

MIDEX Science Progresses HPD Division Goals



Visual of the Sun as sends out a constant stream of particles and energy, which drives a complex space weather system.

Credits: NASA

1. ***Advance the understanding of the physical processes and connections of the Sun, space, and planetary environments throughout the Solar System***
 1. **MUSE:** provide high-cadence observations of the mechanisms driving an array of processes and events in the Sun's atmosphere
 2. **Solaris:** would address fundamental questions of solar and stellar physics that can only be answered with a view of the Sun's poles
 3. **ARCS:** explore the processes that contribute to aurora at the seldom studied intermediate scale between the smaller, local phenomena leading directly to the visible aurora and the larger, global dynamics of the space weather system.
2. ***Advance the scientific understanding of background solar wind, solar wind structures, and coronal mass ejections***
 1. **STORM:** provide the first-ever global view of our vast space weather system in which the solar wind interacts with Earth's magnetosphere.
 2. **HelioSwarm:** observe the solar wind over a wide range of scales in order to determine the fundamental space physics processes that lead energy from large-scale motion to cascade down to finer scales of particle movement within the plasma that fills space.

HELIOPHYSICS SYSTEM OBSERVATORY

- 20 Operating Missions with 27 Spacecraft
- 6 Missions in Formulation

- FORMULATION
- IMPLEMENTATION
- PRIMARY OPS
- EXTENDED OPS

